






**TREATMENT PROTOCOL: CRUSH INJURY / CRUSH SYNDROME**

1. Basic airway ❶
2. Spinal immobilization prn/control bleeding prn
3. Oxygen/pulse oximetry
4. Advanced airway prn
5. Cardiac monitor: document rhythm and attach ECG strip if dysrhythmia identified
6. Venous access
7. For pain management:  
**Morphine ❷❸**
  - 2-12mg slow IV push, titrate to pain relief
  - 4-12mg IM, if unable to obtain venous access
  -  **Pediatric:** 0.1mg/kg slow IV push or IM
  - See Color Code Drug Doses/L.A. County Kids
8. **ESTABLISH BASE CONTACT (ALL)**
9. Fluid resuscitate, hydrate prior to release of compressive force to minimize hypovolemia and to dilute cellular toxins.  
**Normal Saline**
  - 20ml/kg IV bolus (adult and pediatric)
  - 500ml/hr maintenance fluid:
  -  **Pediatric** maintenance fluid:
    - Weight up to 10kg: 4ml/kg/hr
    - Weight 10-20kg: 40ml/hr plus 2ml/kg/hr for each kg between 10 and 20kg❹
    - Weight greater than 20kg: 60ml/hr plus 1 ml/kg/hr for each kg above 20 kg❺
10. If pain unrelieved,  
**Morphine ❷❸**
  - 2-12mg slow IV push, titrate to pain relief
  - 4-12mg IM, if unable to obtain venous access
  - May repeat every 5min, maximum total adult dose 20mg all routes
  -  **Pediatric:** 0.1mg/kg slow IV push or IM
  - See Color Code Drug Doses/L.A. County Kids
  - Maximum pediatric total dose 4mg all routes
11. Release compression and extricate patient
12. If unable to release compression and **situation progresses to CRUSH SYNDROME** (entrapment lasting longer than 4hrs) or suspicion of hyperkalemia (peaked T-waves, absent P-waves and/or widened QRS complex):  
**Albuterol**
  - 5mg via continuous mask nebulization
  -  **Pediatric:** See Color Code Drug Doses/L.A. County Kids
  - 1yr of age or younger:** 2.5mg
  - 1yr of age or older:** 5mg**Calcium Chloride**
  - 1gram slow IV push over 60 sec
  - Pediatrics:** See Color Code Drug Doses/L.A. County Kids.
  - 20mg/kg slow IV push over 60 sec
  - Maximum single dose 500mg
  - Flush IV tubing with normal saline prior to administering sodium bicarbonate to prevent precipitation****Sodium Bicarbonate**
  - 1mEq/kg added to 1L of normal saline, run IV wide open just prior to extrication
  -  **Pediatrics:** See Color Code Drug Doses/L.A. County Kids
  - 1mEq/kg added to 1L of normal saline, administer 20ml/kg IV
13. Release compression and extricate patient

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**SPECIAL CONSIDERATIONS**

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- ❶ Treatment may be compromised by confined space or MCI situation. Ideally, start treatment prior to release of compression. Evaluate for early HERT notification as per Ref. No. 817, Hospital Emergency Response Team. A HERT is utilized in a situation where a life-saving procedure, such as an amputation, is required due to the inability to extricate a patient.
  - ❷ Use with caution: in elderly; if SBP less than 100mmHg; sudden onset acute headache; suspected drug/alcohol intoxication; suspected active labor; nausea/vomiting; respiratory failure or worsening respiratory status
  - ❸ Absolute contraindications: Altered LOC, respiratory rate less than 12 breaths/min, hypersensitivity or allergy
  - ❹ For example, the maintenance rate for a 15kg child is as follows:  
 $40\text{ml/hr} + (2\text{ml/kg/hr} \times 5\text{kg}) = 50\text{ml/hr}$
  - ❺ For example, the maintenance rate for a 30kg child is as follows:  
 $60\text{ml/hr} + (1\text{ml/kg/hr} \times 10\text{kg}) = 70\text{ml/hr}$
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